

Impacts of Climate Change on Indian Agriculture: A Review

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ABSTRACT

Climate change is a phenomenon which can affect the weather condition globally. The impacts of climate change affects every aspects but especially in agriculture of India. Climate condition will affect the productivity of the agriculture as well as the economic growth of India. This review paper based on the study of the different seasons in India, emerging issues which can lead to climate change, the study focused about the positive and negative impacts of climate change in India. In this review the main focus of attraction is the adaption and mitigation process to manage the agriculture from before and after climate change. After that discussed about the scheme launched by the honorable prime minister of India to overcome the issues and increase the productivity of agriculture in India.

Keywords

Adaption, Agriculture, Climate change, Mitigation, Scheme.

Article Received: 10 August 2020, Revised: 25 October 2020, Accepted: 18 November 2020

Introduction

India is a country where climate change is a major course of weather condition for a particular location in India. In traditional culture Indian seasons are divided into six seasons. These seasons are also known as 'RITUS' such as summer season (grishma ritu), Monsoon season (varsha ritu), autumn season (sharad ritu), prewinter season (hemanta ritu), winter season (shishira ritu) and spring season (vasanta ritu). Each season is two month long. Summer season comes in May and June month. In this season, these two months are very hot; the temperature rises up to 42-50°C. Monsoon season comes in July and August month. Monsoon season also called as 'rainy seasons'. This time the weather is very humid and heavy rains occurs in this season also in this time temperature varies from 27-32 °C. Autumn season comes in September, October and middle of November in this season the temperature usually become mild, usually in Himalayan and other areas some trees complete shedding their leaves. The temperature varies from 19- 25°C. Pre-winter comes in late November and December. In this time the weather usually become very pleasant, also the temperature remains same as the autumn. Winter season comes in January and February. This season is also known as 'Dewy season'. In this time the temperature usually remain moderate cold, but pleasant with occasional sunshine. In this time temperature may decrease below 10°C. And the spring season comes in March and April month. In this time the temperature remains around 20 to 30°C. Globally climate is controlled by the mountains, wind and oceans. They are the major factors which can also be responsible for the climate change. Indian agriculture is totally depends upon the Indian weather. There are numbers of sessional crops getting produced in India. India has grown in agriculture field and it becomes the world's largest producer for some of the agriculture products such as: fresh fruits, Buffalo milk, pulses, rice, jute etc.

This review paper based on the study of impacts of the climate change in Indian agriculture. Indian agriculture

totally depends upon the climate. Agriculture and climate change is interlinked with each other[1]. Agriculture is also affected by the global warming, including heavy rainfall, higher temperatures and weather changes. The affected agriculture affects unevenly effects in all over world. Non-agricultural lands are converted into the forests and the agricultural lands too. Agriculture helps to increase the agricultural economy by providing the significant amount of food, comfortable income by exporting the necessary materials which is produced by the Indian farmer.

There are some features of the Indian agricultural with respect to climate changes as followed below:

- 2/3rd area rain dependency: In India the 2/3rd land of the agricultural are dependent on the rain. Because maximum number of food is produced in monsoon season such as rice, pulses and corn. India is the second largest country which in the production of rice. And 50 % of the Indians are depended on agriculture.

- High monsoon dependency: Indian agricultures are highly dependent on the monsoons. In India there are four different seasons which is introduced by the Indian weather bureau i.e., summer, winter, rainy and autumn.

- Close link between water resources and climate: There is a close link between the water resources and climate because if the climate is changing in its proper cycle then the amount of water conserved will be proper for the further use. Because ground level water is highly essential for the production. Therefore water conservation is necessary.

There are some emerging issues which can force the climate change:

- Increasing population: increasing population is the major issue forthe climate change because if population will increases then demand of homes will be increases therefor the agricultural land will be converted into the buildings for living purpose. For any living being the food is the most necessary thing. Therefore the demand for food is getting increased. Rapid population growth creates the problem for the environment. If the food consumption will increases day

by day then this will also affect our agricultural land as well as the climate.

- **Increasing urbanization:** Increasing urbanization may increase the pollution and overcrowded living areas. Urban living may increase the crime and social poverties.

- **Increasing competition for resources:** It is a process of competition between two entities. It happens among the two parties want the same thing at a time. But there is not enough for any one and this will become the reason for their competition. Living beings are competing for resources they need to survive. These resources are limited for the limited organisms. Therefore the competition is increasing between nature and human beings.

- **Trade barriers:** trade barriers are restrictions imposed on the movement of goods between countries (import and export). The major purpose of trade barriers is to promote domestic goods then exported goods, and thus safeguard the domestic industries.

- **New technology consumes more fossil fuels** because the new technologies are invented to travel all over the world there for the consumption of the fossil fuels is increasing, which can increase the carbon emission.

There are some positive impacts of the climate change on Indian agriculture are as followed below:

- The positive impact of the climate change is to reduce the frequency of frost damage. for example in winter season the potato, peas and mustard are produced but if the temperature will decrease in the mid of the winter season then the crops will be damaged[2]. But if the temperature remains constant in the winter season then the frost damage frequency will reduce and the productivity may increase.

- **New flooded areas may become available for fisheries** in coastal regions after the heavy rainfalls in the coastal areas. The agricultural lands get fully drowned in water and agricultural lands are converted into small pond.

There are the some negative impacts of the climate change on Indian agriculture are as followed below:

High and low rainfall is the major impacts which can reduce the production of the food. If the rainfall is less, than production of the food will reduce and if rainfall is high then the land will loss the top most soil which is essential for the crops. The wet condition of the soil can leach the nutrients, especially nitrogen from the soil. Excessive heavy rainfall can lead to fungus, mold of the soil and bacteria.

Day by Day Sea levels are rising and farmers are losing their farmland due to inundation. Salty water of sea can reduce the production of the agricultural food crops therefore many farmers are changing their profession from agricultural to aqua culture. To shift from rice to seafood is also a challenge for farmers to maintain their livelihoods. Aqua culture is not simple and cheap therefore some farmers decide to migrate from sea area to another agricultural area.

Increase in temperature also affect the agriculture because the crops needs a specific temperature to grow and make it effective but if the temperature will raise then the food crops will grow before the time. There for the duration of many crops decreases and yield of crop reduces[3].

Increase in sea and river water temperature can affects the fish breeding because if the temperature will increases then the water temperature of sea and river temperature will also increase which is not good for the fishes and other water organisms.

Adaptation:

adaption of climate change has various definitions such as, adaption is defined as the adjustment of the human with natural system, it response to the actual effect of the climate and climatic stimuli[4]. Adaption is a regulating process in which the socioeconomic system and ecological system collects to reduce possible damages from actual and expected climate change. It is an action to aware the communities for the ecosystem cope with changing climate conditions. Transformation adds to lessening the negative dangers of environmental change and gives chances to utilize the atmosphere for constructive outcomes, it assumes a significant part in relieving the effects of environmental change[5]. Variation incorporates the two activities taken to straightforwardly alleviate the harms from the atmosphere and improve the future versatile limit and activities to add in a roundabout way and evicting the harms from environmental change. Execution of transformation ought to fulfill a few conditions including financial quality, innovation, data, framework, establishments, and value, which are alluded to the parts of versatile limit. Here and there, transformation might be actualized for nothing or requiring little to no effort. Be that as it may, usage for practical transformation measures goes with a specific measure of costs. Moreover, execution of transformation assumes pertinent innovations. It is too important for the viable usage of variation quantifies that the need of transformation measures ought to be recognized and most reasonable variation measures ought to be chosen through the evaluation of accessible transformation measures.

These are the basic steps should be taken too aware the people:

- Assisting farmers in cropping with climate change risk
- Improving land and water management
- Enabling policies- government should launch new policies for the farmers to adopt climate change impacts.
- Adaption research.
- New varieties of technology should launch and these technology should be drought and heat resistance.
- Agricultural insurance.

Adaptation implementation will satisfy the several conditions such as information, technology, infrastructure, institutions, and economic strength. These are referred as the component of adaptive capacity. It is a supposed applicable technology process in which we have pre-prepared for the climate change. Adaption is also refers to the action of the people, countries and societies taken to adjust with the climate change that has occurred.

These are the possible objective of adaption:

- Take advantages into opportunity.
- To increase the capacity of the crops without any damages.
- To reduce exposure to the risk of damage.

Mitigation:

Mitigation is a process to limit the greenhouse gas emissions[6]. It is also used to enhance greenhouse gas sequestration and promote to reduce these greenhouse gases. These are the basic steps to reduce the greenhouse emission with the help of agriculture.

- Organic farming: farmers should use organic farming
- Enriching soil organic matter
- Bio-fuels

It is practically difficult to execute the primary best answer for precisely measure the outer impacts of dangerous atmospheric deviation and force the monetary expenses to the particular ozone harming substance producers[7]. Under this foundation, the second-best answer for creating applicable arrangement programs what's more, shaping proper portfolios to approach is tended to as a commonsense strategy utilizing an arrangement blend. Thinking about the given conditions in a sensible way, the methods for ozone harming substance decrease are characterized into conservative methods, administrative methods, willful understanding, R&D and advancement, data arrangement, and advancement of public awareness. Monetary methods allude to approaches that use market components, for example, charges, carbon charge (or ozone harming substance charge); discharge exchanging plan, and appropriation. Ozone harming substance charge, a plan to force a charge comparable to the information cost for the unit discharge of ozone depleting substance to the particular ozone depleting substance producers, is an ideal monetary intends to accomplish effective asset appropriation utilizing financial impetuses. So as to place this plan in power, ozone depleting substance emanations of every producer ought to be observed and the producer ought to be charged as per the genuine measure of emanation.

The condition of the farmers are terrible because 80% of farmers in India has less than 1 hectare agriculture land. India is called the land of the farmers. Because a farmer who grows the crops has responsibility for making the land for harvesting. Few Indian farmers are selling their crops in the market, while some have agreements with processing companies or establishments. Agriculture in India also contributes significantly to gross domestic product (GDP)[8]. In the situation of food security, environmental technique like management of natural resources, soil conservation, sustainable agriculture are essential for the entire rural area[9]. Indian agriculture sector has been a symbol of blue revolution, white revolution, yellow revolution and green revolution.

There are so many schemes which are launched by the Indian prime minister to promote the Indian agriculture[10]:

Paramparagat Krishi Vikas Yojna (PKVY):

In this scheme, it is used to promote the organic farming in the country. By implementing this process it will improve the soil health of the land and organic matter content and increase the net income of the farmer. It was launched by the NDA government in 2015.

Pradhan Mantri Krishi Sinchayee Yojna:

This scheme was launched on 1st July 2015. The main motto of this scheme is "HAR KHET ME PANI HO" it is being implemented to expand cultivated area with assured irrigation. This scheme provide protective irrigation by harnessing rain water at micro level through 'jal sanchay' and 'jal sinchan'

Pradhan Mantri Fasal Bima Yojna:

Pradhan mantri fasal bima yojna and restricted weather based crop insurance scheme (RWBCIS) was launched in 2016 at the time of kharif. It is used to provide comprehensive crop insurance (bima) coverage from presiding.

PM Kisan Scheme:

This is used to provide 6000/- INR per year to the farmers family. This is provided to those who had holding 2 hectare cultivated land. This 6000/- would be released in installment of 2000/- in every 4 month duration.

National Agriculture Market:

This scheme is launched with a motto i.e., 'one nation one market'. It is a national level platform of e-marketing. This is the innovative market process to revolutionizing the agricultural market by ensuring the better price.

Discussion

In this review paper we have studied about the impacts of the climate change in Indian agriculture. Here we have studied about the different seasons in India and their temperatures i.e., highly responsible for the climate change. The Indian agriculture is highly depended in the seasons and the monsoons. It helps to increase the economy trade. We have also discussed about the various features of the agriculture such as 2/3rd area rain dependency, high monsoon dependency and close interconnection between water resources and with the climate change. After that we have studied about the major issues which can rise the climate change like increasing population, increasing urbanization, increasing completion of resources, increasing globalization and new technology which is also responsible for the climate change. After studied these major issues it shows all the issues are interlinked with each other. The major issue is the population, if the population increases then the demand of land will increase, water demand will also increase, and competition of resources will increase. After that we have studied about the positive impact of the climate change because the seasonal crops needs different seasons to grow and helps to enhance their productivity of, Rice, jute, pulses need perfect temperature to increases the productivity. For example if temperature increases 1 degree then the wheat productivity will reduces. 1 degree temperature decrease the productivity and it will result into lose up to 4-5 tons wheat. Also climate change increases the negative impact of the agriculture therefor the agricultural

trade will be imbalance. All the industries will be affected and the resources will also be affected.

Adaption and Mitigation are the two major steps to be taken to rescue the agriculture from the climate change. In this step we have studied about how to manage the agricultural land before and after the climate change. We learn to assist other people to manage and aware about the climate change. There are so many schemes launched by the Indian government which is used to improve the agriculture land and healthy soil for the production of the food crops. These schemes are in progress to serve the nation.

Conclusion

Climate change is a reality. If we have not done anything then the cost of inaction would be higher than adaptation and mitigation costs. So, India will have to act proactively. The increasing amount of the greenhouse gases is causing the climate change which occurs high impacts on societies and ecosystem. Climate change will occur because of the changes occur in the environment due to pollution, disasters and emission of gases. The main aim of the adaptation is to reduce the vulnerability of agriculture system to the impact of climate change and climate related risks and mitigation is used to addresses the causes of the climate change.

In future the management of the agriculture is important because the natural resources are decreasing every day. The consumption of the resources are high because of the population growth therefore we have to manage the population also.

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